Guidance for Used Fluorescent Lamp Management

FACT SHEET

Problems of Fluorescent Lamp Disposal

Approximately 15 million used fluorescent lamps are generated in North Carolina each year. Fluorescent lamps and High Intensity Discharge (HID) lamps contain mercury as an essential component for operation. Studies have shown that used 4-foot fluorescent lamps contain approximately 30 to 40 milligrams (mg) of mercury. When a lamp is broken, disposed in a landfill, or incinerated, the mercury can contaminate air, surface water, or groundwater. Contamination is a concern because mercury is a highly toxic metal that bioaccumulates through the food chain and affects a variety of body systems including the nervous system and kidneys. Mercury emissions have contributed to surface water contamination, which has caused elevated concentrations in fish. As of November 1994, thirty-four states have issued fish consumption advisories to warn of elevated levels of mercury in fish. Eight such advisories have been issued in North Carolina.

The U.S. Environmental Protection Agency (EPA) has estimated that lamps containing mercury contribute 3.8 percent of all mercury entering municipal solid waste (MSW) landfills. (The largest source of mercury, approximately 88 percent, in the MSW stream comes from household batteries (e.g., alkaline batteries); the next largest contributors are mercury-containing thermostats, thermometers, and fluorescent lamps.) Although the direct relationship between mercury in landfills and its leachability into groundwater is under some dispute, 23 unlined landfills in North Carolina have exhibited mercury levels in ground water above the maximum contaminant level for drinking water. Data for mercury levels in newer, lined h&fills are currently unavailable.

Tests conducted by the National Electrical Manufacturing Association (NEMA) and by EPA have shown that a significant percentage of fluorescent lamps can be characterized as a hazardous waste under the Resource Conservation and Recovery Act (RCRA) because they surpass the 0.2 mg/L mercury limit by the toxicity characteristic leaching procedure (TCLP). The TCLP is a toxicity test that measures the potential of a waste to leach in a landfill.

Energy-Efficient Lighting is Still the Environmentally and Economically Sound Choice

Despite the challenges associated with recycling or disposal of fluorescent lamps and HlDs, use of these highly efficient lighting systems will result in a net decrease in mercury releases to the environment - even when mercury in the lamps is counted - because less energy is used to operate these systems. As fossil-fuel-burning power plants are the largest emitters of mercury emissions, reduced energy usage through use of energy-efficient lighting means less reliance on non-renewable resources as well as substantial reductions in carbon dioxide, sulfur dioxide, and nitrogen dioxide air emissions. Thus, installation of energy-efficient lighting is still one of the best choices a business or industry can make to protect the environment and to save money.

NC Office of Waste Reduction and NC Division of Solid Waste Management

High-efficiency fluorescent lamps and HIDs are two types of energy-efficient lighting systems that EPA promotes through its Green Lights Program. The Green Lights Program can be reached at (202) 862-1145.

Trends in Fluorescent Lamp Manufacturing

Fluorescent lamp manufacturers have significantly reduced the amount of mercury in lamps as well as increased their energy efficiency. Average mercury content in a 4-foot lamp dropped 14 percent between 1985 and 1990, and industry predicts an additional 35-percent reduction by 1995. Even with these reductions, fluorescent lamps are still likely to be considered a hazardous waste under the current TCLP testing requirement.

Waste Management Options for Mercury-Containing Lamps

Current Regulatory Status for Disposal of Fluorescent Lamps

Current State and Federal laws may characterize mercury-containing lamps as a hazardous waste. Under RCRA used fluorescent lamps (as with most other wastes) are subject to evaluation for a hazardous waste characteristic, including the toxicity characteristic. The generator of the waste is responsible for making this determination. A waste found to exhibit the toxicity characteristic is defined as hazardous and must be managed according to hazardous waste storage, treatment, and disposal regulations, unless otherwise excluded. As mentioned, EPA and NEMA test results have shown a sign&ant percentage of mercury-containing lamps to be characterized as hazardous waste by the TCLP test.

North Carolina Solid Waste Management Rule 15A NCAC 13B. 1626 prohibits the disposal of hazardous waste in a MSW landfill. Conditionally exempt small quantity generators (CESQGs) are also included in this prohibition. Thus, no hazardous fluorescent lamps from a commercial source may go to a MSW landfill. Household fluorescent lamps are, however, exempt from these regulations.

Currently, if a business or industry disposes of more than approximately 300 to 350 4-foot T-12 fluorescent lamps or 400 to 450 4-foot T-S lamps in any month, it can no longer claim the status of an exempt small quantity generator, unless it can prove that the lamps are non-hazardous.

Some local governments may place additional disposal restrictions on mercury-containing lamps. The local solid waste agency should be contacted for information about local disposal restrictions and preferred management options. For local agency contacts, consult the local telephone directory or the NC Office of Waste Reduction at (919) 571-4100).

Recycling Lamps and Hazardous Waste Exemptions

- Intact lamps sent to a recycler will not be regulated as a hazardous waste in North Carolina.
- Generators who recycle intact lamps are permitted time to accumulate a sufficient quantity to make recycling more economically feasible.
- The quantity of lamps will not be used in determining the hazardous waste generator status.

Any lamp may be recycled at a permitted *or* licensed recycling facility whether or not it tests hazardous. The need for waste manifesting will vary with the requirements of the recycler, the transporter, and the states crossed enroute to the recycler.

Recycling facilities separate the toxic substances (such as mercury) from the glass, aluminum end caps, and other components. Aluminum end-caps are recycled as scrap metal, and glass is typically used as a filler material in such products as fiberglass. Mercury is usually reclaimed through a retorting (distillation-like)

process. The small end value of the reclaimed materials influences the amount charged for processing. Generators should ask their prospective service providers about the final use for all recycled components of the lamps.

Handling Fluorescent Lamps for Recycling

Most recycling facilities prefer to receive lamps intact, although some facilitates will accept crushed tubes in lined drums. Intact bulbs should be packed either in their original carton, for which paper dividers are not necessary, or special containers. Many recycling services can provide containers, and some have specially designed containers that can be used for storage of spent lamps until they are shipped. Some recyclers may require that 4-foot lamps be repackaged in their original cartons, palletized, and shrink-wrapped. The company generally will specify the packaging it prefers for the lamps.

Costs of Recycling

The specific cost of recycling bulbs will depend on the volume, distance, and specific services chosen by the client. Recycling costs on the average are 10 cents per foot of lamp, not including shipping and handling fees. The cost for recycling HID lamps ranges from $1.25 to $4.50 per lamp. The cost of recycling a lamp is quite modest in terms of its HID life-cycle cost. At $64 ($0.07 per kWh) to operate a lamp for a 20,000-hour life, a 50-cent recycling cost would be less than 1 percent of the cost of operation

Recycling Services Available

Lamp recyclers offer services ranging from no transportation with flat rates at the recycler's dock to full service operations that include transportation, packaging, loading, and paperwork. Most full service operations will work with the customer to determine the optimum package for the customer's needs. A list of fluorescent lamp handlers providing service to businesses in North Carolina is provided with this Fact Sheet.

Hazardous Waste Disposal of Lamps - Costs and Liabilities

- Many hazardous waste handlers offer waste disposal services for fluorescent lamps. The generator must meet all RCRA management, storage, and shipping requirements.

l EPA has estimated that the cost to dispose of lamps in hazardous waste landfills ranges between 25 to 50 cents per 4-foot lamp, not including packaging transportation, or profile fees.

l It is important that generators understand the liability issues associated with the disposal of hazardous waste. Generators may be legitimately concerned about potential future Superfund liability in connection with any disposal method. All generators of mercury-containing lamps waste, regardless of amount, could be held liable in any subsequent Superfund cleanup at hazardous waste landfills or at MSW landfills.

Current EPA Proposals for the Management of Fluorescent Lamps

In the June 27,1994, Federal Register, EPA proposed two modifications to the Hazardous Waste Program for the management of mercury-containing lamps. First, EPA has asked if an exclusion for mercury-containing lamps from regulation as hazardous waste would be appropriate, provided lamps are disposed in municipal Subtitle D lined landfills. The second approach is to include mercury-containing lamps under the newly approved Federal Universal Waste Rule. The Universal Waste approach is a streamlined, reduced regulatory structure designed to address proper management of certain widely generated wastes that fall under the RCRA Subtitle C regulations. The NC Division of Solid Waste Management supports

the inclusion of mercury-containing lamps under the Universal Waste Rule. However, even if the lamp exclusion is adopted at the Federal level, the Division could not support or adopt a rule to exclude mercury waste from hazardous waste regulation because of the current State law prohibiting the disposal of hazardous waste in Subtitle D landfills.

Incineration of Lamps is Highly Discouraged

EPA advises that mercury-containing lamps should never be incinerated because most solid waste combustors lack the necessary emission control devices to effectively remove mercury from the flue gases. EPA estimates that the elimination of mercury-containing lamps from MSW incinerators would result in a 3-percent decrease in mercury-bearing waste in all MSW that is incinerated

Crushing Lamps for Volume Reduction

Most recyclers prefer to receive mercury-containing lamps intact. Although lamp crushing by generators is generally discouraged, it can be performed with the proper equipment and provisions to meet all RCRA and Occupational Safety and Health Administration (OSHA) regulatory requirements.

The act of lamp crushing is considered treatment of a hazardous waste if a generator assumes or has determined lamps to be hazardous. According to 40 CFR 268.7(a)(4), treatment in an accumulation container is allowed if a waste analysis plan is in place. A treatment plan as part of the waste analysis plan, would have to include the capture of all gases in the lamps. The plan should include prevention measures such as detection methods for mercury vapors as well as emergency shutdown measures. Without these plans, the crushing of lamps would not be considered legitimate treatment or volume reduction.

A recent study on fluorescent lamp crushing found that crushing units that do not operate under negative pressure and do not contain emission control equipment (such as carbon canisters) can exceed the OSHA worker exposure limits of 0.05 mg/m^3 for mercury during normal operations. Currently, exposure data are not available for incidental breakage of lamps.

Suggestions For Working With Relamping Contractors - Generator's Responsibilities

Any lighting upgrade projects or relamping maintenance operations should include specifications for proper handling and safe recycling or disposal of lamps, ballasts, or other hazardous materials. Below are some general suggestions for working with relamping contractors:

- Ask the lighting or electrical contractor to provide recycling or disposal services either directly or through a subcontractor as part of the contract, along with shipping and disposition documentation
- Do not expect your relamping contractor to be well versed in all disposal requirements and options. Remember, the generator is ultimately responsible for the management of the waste.
- Ask for certifications, licenses, and references from all subcontractors who provide recycling or disposal services.

Household Hazardous Waste Collection and Conditionally Exempt Generators

The North Carolina Office of Waste Reduction and the Division of Solid Waste Management encourage the support of business and industry in local Household Hazardous Waste (HHW) collection programs. Local governments that conduct HHW collection programs can choose to allow CESQGs to participate in the program. Such programs have typically required CESQGs to pay a fee for waste disposed but can offer an

opportunity for CESQGs to recycle or dispose of lamps and other hazardous waste at reduced costs. CESQGs are encouraged to support such collection programs.

For Additional Information:

For more information on regulatory issues, call the NC Division of Solid Waste Management, Hazardous Waste Section, at (9 19) 733-2178. For more information on the EPA Green Lights Program, lamp recyclers, or lamp source reduction activities, call the NC Office of Waste Reduction at (919) 571-4100.

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OWR-95-08. 150 copies of this document were printed on recycled paper at a cost of $13.65 or $0.09 per copy.

Fluorescent Light Servicers and Recyclers

Company	Address	Phone/Fax	Contact	Services offered	Specifications	Other conditions	General costs	Products recycled or disposed	Servicer or Recycler	Other locations
Advanced Environmental Recycling Corp.	2591 Mitchell Avenue Allentown, PA 18103	(800) 554-2372 (215) 797-7696	Renee O'Neil	Lights	Intact bulbs only	Full turn key; intact bulbs only	Prices depend on volume and location	Recycled	R	Mercury Technologies International: Hayward, CA; Melbourne, FL
Advanced Environmental Technology Corps	2176 Will Sweet Road Creedmoor, NC 27522	(800) 322-8350 -	Jeff Page	Lights and Ballasts	None; Company will come on site and package material	None	Prices available on request; Varies with quantity; Shipping included in price	Recycled	S	
Ameri-waste Environmental Services	6111 Carle Drive Valley View, OH 44125	(800) 343-2179 -	Betty Kavalchec	Lights	Drums or pallets up to 3 ft high (in original packaging); crushed or intact lamps	No minimum quantity, shipping included in price	55 gallon drum = $132 85 gallon drum = $230 1 pallet = $225	Disposed	S	
Bethlehem Apparatus Co., Inc.	890 Front Street P.O. Box Y Hellertown, PA 18055	(610) 838-7034 -	John Boyle	Lights	Intact or crushed bulbs	Self-designed package: 2 quart rubbermaid for small quantities	Prices depend on type and quantity	Recycled	R	
Chemical Waste Management	2600 Delk Road Marrietta, GA 30067	(800) 541-5511 ext 775 -	Attention sales	Lights and Ballasts	Tubes: intact in original packaging or drums, crushed in drums; Ballasts: in drums, boxes or pallets	No minimum quantity; Shipping included in price	Prices available on request	Tubes recycled; Ballasts landfilled or recycled on request	S	
Eastern Environmental Technologies, Inc.	47 Purdy Avenue Port Chester, NY 10573	(800) 808-7227 (914) 934-9659	Neil Farans	Lights and Ballasts		Full service; Minimum quantity: ballasts = 1 drum, none for tubes	Prices based on quantity	Recycled	R	
Ecoflo Inc.	2750 Patterson Street Greensboro, NC 27407	(910) 855-7925 -	Anne Rudd	Lights and Ballasts	Tubes: intact only in original packaging or box provided on request; Ballasts in drums	No minimum quantity	Prices available on request; Varies with type	Recycled; (also have household hazardous waste collection point)	S	
Environmental Energy Group	1720 Wesminster; Suite B P.O. Box 50764 Denton, TX 76205	(817) 898-1291 (817) 566-6315	Dan Bigler	Lights and Ballasts	Intact bulbs only	full service, broker for full incineration; No minimum quantity	Ballasts $.75-.80 lb, for small volume $.85-.90 lb	Lamps recycled; Ballasts disposed	R	
Environmental Management Systems	P.O. Box 6434 High Point, NC 27262	(910) 869-8836	David Crowley Beverly Ivey	Lights and Ballasts	Intact tubes in original boxes or provided containers	Preferred minimum quantity 5,00/yr	Staged pricing	Recycled	S/R	Memphis, TN
FulCircle Ballast Recyclers	180 Fawcett Street Cambridge, MA 02138	(617) 876-2229 (617) 876-6655	Michelle Bailargeon	Ballasts	Pre-drummed in 17H or 17C drums (will provide)	Full service; Minimum charge = 1 drum	$.50 - 1.25 pound, depending on volume	Recycled	R	
Global Recycling Technologies, Inc.	387 Page Street Stoughton, MA 02072	(617) 341-6080 (617) 341-6088	Rick Tyler	Lights and Ballasts	Intact bulbs only	Full service; Will accept all batteries; No minimum quantity	Prices at market value	Both	R	Scotch Plains, NJ
Industrial Brokerage Service (IBS)	P.O. Box 1263 Lenior, NC 28645	(704) 396-4319 -	Ron Brooks	Lights	Tubes in original packaging or in box provided by IBS	No minimum quantity	Prices vary with location; Shipping included in price; Typical: $ .84 per 4 foot lamp	Recycled	S	
Laidlaw Environmental Services	208 Watlington Industrial Rd Reidsville, NC 27320	(910) 342-6106 -	Joy Baker	Lights and Ballasts	Must be in original packaging or in box purchased from the company	Minimum quantity 1 box or drum; Shipping costs included in price	Bulbs<4 ft = 78c per bulb; bulbs>4 ft = $1.05 per bulb; broken lamps = $2.73 each; 1 box (106 lamps) = $2.60	Recycled	S	
Light Recycling	115 Buckminster Road Brookline, MA 02146	(617) 734-1047 (617) 734-3113							R	

Lighting Resources, Inc.	37 Foster Drive Willimantic, CT 06226	(800) 866-6818 (203) 423-5572	David Chilcott	Lights and Ballasts	Intact bulbs only	Minimum quantity for pickup = 5,000 lamps	Lamps by foot, ballasts by pound	Recycled	R	Sheridan, WY; Ontario, CA; Phoenix, AZ; Greenwood, IN
Marpan Supply Co., Inc.	P.O. Box 2068 Tallahassee, FL 32316	(904) 224-9353 (904) 224-1790	Larry Lassiter	Lights	Prefer intact bulbs, Broken lamps charged by pound	No minimum quantity	Costs freight paid in FL: 4ft lamps $.38; lamps>4ft+ $.75; HID $1.70	Recycled	R	
Mercury Recovery Services	2021 S. Myrtle Avenue Monrovia, CA 91016	(800) 834-8598 (818) 358-2703	Bob Roberts	Lights	freight pre-paid only; intact or crushed bulbs	No minimum quantity	$500/drum crushed; tubes $.06 ft; HID $1.25/each; other $.50	Recycled	R	
Mercury Refining Company, Inc.	1218 Central Ave Albany, NY 12205	(800) 833-3505 (518) 459-2334	Barbara Sauer	Lights	Intact, packed; crushed in lined drums	Minimum quantity, $500; Can provide containers	Intact $.15-.17 ft; crushed $.36-.40 gallon	Recycled	R	
Mercury Technologies of Minnesota, Inc.	1360 Holstein Drive P.O. Box 13 Pine City, MN 55063-0013	(612) 629-7888 (612) 629-7799	Sue Yarusso	Lights	Need information if unusual materials are coming	Sub-contract for transportation	Prices depend on distance and volume		R	
Recyclights	2010 East Hennepin Ave Minneapolis, MN 55413	(612) 378-9568 (612) 378-1179	Donna Woodruff	Lights	Intact bulbs in original packaging, palletized, shrink wrapped	Also accept thermostats, thermometers, and switches; Minimum quantity, 100 lamps	Prices depend on distance and volume	Recycled	R	Tallahassee, FL
S.D. Myers	180 South Avenue Tallmadge, OH 44278	(800) 444-9580 -	Tom Ocepek	Ballasts	Drums (if leaking) or corrugated boxes (if not leaking)	No minimum quantity; shipping included in price	Prices available on request	Recycled	S	
Salesco Systems USA, Inc.	5 Cabot Place Stoughton, MA 02072	(800) 368-8878 (617) 344-1271	Jeff Pontiff	Lights and Ballasts	Ballasts: 55 gal drums; bulbs, in original boxes or provided container	Full service; No minimum quantity	Prices depend on volume; $.85/lb ballasts; $.10/ft lamps with ballasts; $.14/ft tubs only	Both	R	HQ-Phoenix, Dallas, San Diego, Chicago
Superior Lamp Recycling, Inc.	P.O. Box 556 Port Washington, WI 53074	(800) 932-6216 (414) 284-9208	Jill Tronca	Lights	Packed, palleted, shrink wrapped, (5 boxes high); 8ft in original box	Also take incandescents; No minimum quantity	Prices based on distance; $.38 4 ft	Recycled	R	
Van Waters and Rogers	3600 West Wendover Ave Greensboro, NC 27407	(800) 438-1119 -	Sid Lively	Lights and Ballasts	Tubes: single in original packaging; multiple in drums; broken in DOT approved containers; Ballasts in drums or original packaging	No minimum quantity; shipping included in price	Prices available on request	Recycled	S	

FLUORESCENT LIGHTS

Most fluorescent lamps, by the TCLP, test 0.2 ppm or greater for mercury and thus are hazardous wastes (DOO9) when disposed. Intact fluorescent lamps sent to a recycler will not be regulated as such. However, these intact lamps or broken ones would have to be handled as any other hazardous waste if disposed of rather than recycled properly. If these are claimed to be non-hazardous, a laboratory analysis would have to substantiate this claim.

Recycling - Intact Lamps

Since intact lamps to be recycled will not be regulated as a RCRA hazardous waste, the generator of the intact tubes will have time to accumulate enough to make it economically feasible to recycle them. Also, the quantity will not be counted in determining the hazardous waste generator status. One recycler said that the recyclable parts may be separated more easily with the intact tubes and that a smaller volume is retorted to recover the mercury; all of the crushed material has to be retorted at a net higher cost per tube.

Recycling - Crushed/Broken Lamps

Drums are available in which fluorescent lights are crushed and the vapor collected. This process is considered treatment of a hazardous waste but is allowed in accumulation containers with certain precautions. The bulbs themselves are containers holding the gaseous mercury. Any treatment process would have to include the capture of mercury gases contained in the fluorescent tube. Otherwise this crushing would not be called legitimate treatment or volume reduction. Changing the gaseous mercury filter before a spillover must be done. Testing for leaking mercury gas is advised. Recycling of the mercury and other material in the drum is highly recommended.

Disposal

Hazardous waste is forbidden in North Carolina's Sanitary Landfills. Conditionally Exempt Small Generators are included in this prohibition of sending any hazardous waste to a Solid Waste Landfill. No fluorescent lamps from a commercial source may go to a solid waste landfill. Household lamps are, however; exempt from these regulations.

Replacing lighting systems with energy efficient ones can cut energy costs. EPA's Green Lights Program offers free workshops for those companies who wish to accomplish this goal. The contact is Dean Brockob [(202) 862-1145]. Lighting consultants also provide this service. Attached are copies of relevant pages from the Green Lights Program Lighting Upgrade Manual and of Fluorescent Lighting vendors.

For further questions, please call Margaret S. Babb, CHMM, Environmental Chemist, Hazardous Waste Section at (919) 733-2178.

[Flolight.MSB (Revised 12/94)]